PHOTOCHEMICAL ASSESSMENT MONITORING STATIONS (PAMS) PLAN

INTRODUCTION

In accordance with Section 182(c)(1) of the Clean Air Act Amendments of 1990, affected states must design an enhanced monitoring system for O3 and its precursors. Specifically, O3 nonattainment areas listed as serious, severe or extreme must submit an acceptable plan to establish a Photochemical Assessment Monitoring Stations (PAMS) network with improved monitoring for ambient concentrations of ozone, oxides of nitrogen, and volatile organic compounds. This requirement applies to Southeast Pennsylvania, a part of the Philadelphia-Wilmington-Trenton CMSA area, which has been classified as an area of severe nonattainment.

The Commonwealth of Pennsylvania, Bureau of Air Quality Control, has submitted the attached PAMS plan to EPA for approval. The submittal contains the required PAMS network description, including all associated maps, schedules and summaries and meets all the requirements of the minimum monitoring program for PAMS. Data from this program will be used to refine control strategies for attaining the ozone National Ambient Air Quality Standard (NAQSS), to make determinations concerning the contribution of sources in the area and to determine progress in achieving attainment.

PHOTOCHEMICAL ASSESSMENT MONITORING STATIONS
STANDARD PLAN

1. NETWORK OVERVIEW

Philadelphia County and other counties of Southeast Pennsylvania which are part of the Philadelphia CMSA are classified as a SEVERE nonattainment area. Since this CMSA has a population greater than 2,000,000, a minimum of 5 PAMS sites must be established to adequately characterize the emissions of the area. Some of these required sites are or will be located outside the Commonwealth of Pennsylvania state boundaries and will become the responsibility of adjacent states (Delaware, New Jersey and Maryland).

Figure 2 in Attachment A is a topographic map showing land features and geographical influences of the Philadelphia CMSA. As seen on this map, most of this area has level, tide water topography. It is bounded by rolling lowland area to the west, the Atlantic Ocean on the east and south and the Delaware River Valley to the north. The middle of the air basin is dominated by the Delaware and, to a lesser extent, the Schuylkill Rivers. Philadelphia's industrial districts are concentrated along the lower reaches of the Schuylkill River, near the merger with the Delaware, along the Delaware River in both directions from Center City and along the rail corridor in North Philadelphia and Kensington.

The average daily temperature for June, July and August is 75^{o}F, with daily maximums reaching 96^{o}F. For elevated ozone days (O3 >.1 ppm), the predominant wind direction for the morning hours (7 AM to 10 AM) is from the SW with a weak second predominant component from the SSW. In the afternoon hours (1 PM to 4 PM), the predominant wind direction is also from the SW with a slightly stronger second predominant component from the SSW. Wind velocities are slightly higher in the afternoon hours.

One Type 2 site has already been established in Philadelphia County and is operated and maintained by the Philadelphia Air Management Services. This site has been in operation since 1993. The purpose of this site is to monitor maximum precursor emissions on a neighborhood scale.

The Department will embark on a limited sampling program, starting this summer, to ascertain the location of additional sites which may be needed to better characterize and track VOC trends and provide a database for evaluation of control effects and transported precursors entering and leaving Pennsylvania.

Pennsylvania DER anticipates location of a Type 2 site in the northeast urban fringe of Philadelphia County in 1995. This site, located in the growth area and transportation corridor of the CMSA,

will help characterize the VOC trends and serve to evaluate the present and future control strategies and their cost effectiveness. It will likely coincide with a site used to determine DER attainment with the NAAQS.

Pennsylvania DER also anticipates creating a Type 1 at its existing Chester air monitoring site in 1996. This site is ideally suited to characterize transported ozone and VOC precursors entering Pennsylvania. It is quite likely that this Chester site could also serve as the Type 3 site for the Washington/Baltimore CMSA, since it was the design-value site for the Philadelphia CMSA.

Figure 1 of Attachment A depicts the enhanced ozone monitoring network proposed for Southeast Pennsylvania (SE PA). In addition to the proposed and existing PAMS stations, ozone NAMS/SLAMS sites that are currently operational are shown.

The actual location of the two proposed sites, described above, have not yet been established. It is anticipated that as a result of the canister sampling programs to be instituted during the 1994 and 1995 ozone seasons, a better determination on the placement of these sites will be acquired. The implementation of these additional sites will be detailed in ensuing PAMS network submittals.

2. SITE IDENTIFICATION

Philadelphia County - Downwind Boundary of Central Business District

This type 2 site was established in 1993. As prescribed in the PAMS guidance document, the following attachments include all required monitoring site information. Also included are pictures from the four major compass directions and a short VHS video, showing the glass manifold location on the roof of the Philadelphia lab building and 360^{o} panoramic view of the immediate surrounding land use/terrain.

ATTACHMENT A

- AIRS Site Description Inventory sheet (AMP380) which includes Site and Monitor Identification information.
- Figure 1 - Map showing existing PA PAMS/SLAMS ozone sites.
- Figure 2 - Topo map of PAMS monitoring area, 2 km radius.
- Figure 3 - A 1/4 mile radius map.

ATTACHMENT B

Figure 4 - Morning wind roses for high ozone and ozone conducive days.

ATTACHMENT C

Figure 5 - Emission Inventory Summary for Philadelphia MSA.
Figure 6 - VOC point source emissions >10 TPY.
Figure 7 - NOX emissions >100 TPY.
Figure 8 - CO emissions.

3. SAMPLING AND ANALYSIS METHODS

As required in 49 CFR Part 58, Appendix C, Section 4.1 and 4.2, Ambient Air Quality Methodology, methods used for O3, NO, NO2 and NOX monitoring at PAMS sites will be automated reference or equivalent methods (as defined in 40 CFR Part 58, Section 50.1).

Speciated VOC and carbonyl monitoring will be conducted in accordance with the Technical Assistance Document (TAD) for Sampling and Analysis of Ozone Precursors, EPA 600/8-91-215, October 1991.

Meteorological measurements (wind speed, wind direction, barometric pressure, ambient temperature, relative humidity and solar radiation) will be conducted in accordance with the Quality Assurance Handbook for Air Pollution Measurement Systems: Volume IV, EPA 600/4-90-003, August 1989.

4. MONITORING PERIOD

All PAMS ozone and meteorological monitors will operate during the US EPA designated ozone season for Pennsylvania, April through October (Network Design Criteria for Ozone, 40 CFR Part 58, Appendix D, Section 2.5).

Ozone precursor sampling (NO, NO2, NOX, VOC and carbonyl) will be conducted during the months of June, July and August.

5. SAMPLING FREQUENCIES

PAMS monitoring for ozone will be continuous and operated over the US EPA designated ozone season (see above).

Monitoring for meteorological parameters, NO, NO2 and NOX will be continuous and operated year-round.

Sampling frequencies for VOC and carbonyl monitoring will satisfy the conditions of a Type 2 site as follows:

Automated Gas Chromatograph - 8 3-hour samples everyday (June through August) and 1 24-hour calculated average every sixth day (year-round).
Carbonyl - 8 3-hour samples everyday (June thru August).

All sampling frequencies are in accordance with minimum network requirements as found in 40 CFR Part 58, Appendix D, Section 4.4.

6. METEOROLOGICAL MONITORING

At the present time, a meteorological station is located approximately 2 miles east of the existing PAMS site. This station is generally considered representative of the monitoring area. Plans are underway to secure a new meteorological monitoring station approximately 100 meters to the north of the PAMS site. All installed equipment will comply with requirements stipulated in 40 CFR Part 58, Appendix D, Section 4.6.

An upper air meteorological(UAM) monitoring site is in operation in New Brunswick, New Jersey. This meteorological site is considered representative of the upper air in the SE PA nonattainment area and is believed to satisfy the UAM requirement for both the Philadelphia and New York areas. If it is later determined that this station does not meet UAM requirements, a new UAM station will be established in the Greater Philadelphia area.

The Commonwealth of Pennsylvania operates air monitoring stations with meteorological instrumentation on a ten meter tower at Chester, Norristown and Bristol. Data from these stations are expected to corroborate meteorological conditions present at the Philadelphia County PAMS site and meet the monitoring objectives associated with various air quality analyses, modeling needs and performance evaluations.

7. NETWORK IMPLEMENTATION

The implementation schedule for PAMS stations within the Commonwealth of Pennsylvania state boundaries is as follows:

YEAR	STATION	
Operating	Type 2	Phila CBD
1995	Type 2	NE Urban Fringe of Phila (Mont. Co.)
1996	Type 1	Chester area

8. QUALITY ASSURANCE

The PAMS Quality Assurance Program has been developed in accordance with the provisions of 40 CFR Part 58 Appendix A. Approved and existing quality assurance plans will continue to be used, where applicable. As guidance from US EPA is received, those plans will be updated.

ATTACHMENT A - SITE DESCRIPTION INFORMATION

AMP380 Report - Site Description Inventory

Figure 1 - PA PAMS/SLAMS Ozone Sites

Figure 2 - Topo Map, 2 km Radius

Figure 3 - 1/4 Mile Radius

AEROMETRIC INFORMATION RETRIEVAL SYSTEM (AIRS)
AIR QUALITY SUBSYSTEM
SITE DESCRIPTION INVENTORY

EPA REGION: 03 STATE (42): PENNSYLVANIA

SITE ID: 42-101-0004 ADDRESS: 1501 E LYCOMING AVE AMS LAB STATE/LOCAL ID:
CITY POPULATION : 1,688,210 CITY (60000): PHILADELPHIA DIST CITY: 009 K UTM ZONE : 18
AQCR POPULATION : 5,487,472 COUNTY (101): PHILADELPHIA CO DIFF GMT : 05 UTM NORTH: 4428538
DATE ESTABLISHED: 1966/02/01 ELEV MSL : 22 M UTM EAST : 491607
MET SITE: DATE TERMINATED : / / COMP SECT: NE LATITUDE : +40:00:32
SITE ID : - - DATE LAST UPDATE: 1993/03/05 LONGITUDE: -075:05:54
DISTANCE SITE : M HQ EVAL DATE : 1992/03/12
DIRECTION SITE: REGN EVAL DATE : 1988/09/15
TYPE SITE ( ):

AQCR (045): METROPOLITAN PHILADELPHIA
CMSA LOCATED IN (0000): ** DESCRIPTION UNKNOWN **
LAND USE (1): RESIDENTIAL
LOCATION SETTING (1): URBAN AND CENTER CITY
MSA LOCATED IN (6160): PHILADELPHIA, PA-NJ
SITE COMMENT 1 : STATE OF PENNSYLVANIA
SUPPORTING AGENCY (003): PHILADELPHIA AIR MANAGEMENT SERVICES
URBAN AREA REPRESENTED (6160): PHILADELPHIA, PA-NJ

TANGENT STREET:

STREET #	TRAFFIC FLOW	YR TRAFFIC	DIR	STREET NAME	TYPE ROAD
1	15000				(4): MAJ ST OR HY
2	14500				(4): MAJ ST OR HY
3	2300				(5): THRU ST OR HY

NITRIC OXIDE
PARAMETER : 42601 DATE SAMPLING BEGAN: 1980/01/01 SITE CRITERIA MET : DATE SITE CRITERIA MET: /
POC : 1 DATE SAMPLING ENDED: / / REF MTHOD USED : REF METHOD USED DATE : /
MONITOR TYPE : 0 DATE TYPE EFFECTIVE: 1980/01/01 QA PLAN : QA EFFECTIVE DATE : 81/01
REPORTING ORGANIZ : RO EFFECTIVE DATE : / / ACTION TYPE : ACTION TYPE REASON :
COLLECTING LAB : 000 AUDIT DATE : / / MONITOR OPEN PATH NUM : PROJECT CLASS : 01
ANALYZING LAB : 000 PROBE LOCATION ( ):
UNRESTRIC AIR FLOW: PROBE HEIGHT : 5 M HORIZONTAL DISTANCE : VERTICAL DISTANCE :

MONITOR COMMENTS 1: 14

NITROGEN DIOXIDE
PARAMETER : 42602 DATE SAMPLING BEGAN: 1977/01/01 SITE CRITERIA MET : Y DATE SITE CRITERIA MET: 1981/04
POC : 3 DATE SAMPLING ENDED: / / REF MTHOD USED : Y REF METHOD USED DATE : 1979/01
MONITOR TYPE : 1 DATE TYPE EFFECTIVE: 1981/01/01 QA PLAN : Y QA EFFECTIVE DATE : 1981/01
REPORTING ORGANIZ : 003 RO EFFECTIVE DATE : 1981/01/01 ACTION TYPE : APP ACTION TYPE REASON :
COLLECTING LAB : 000 AUDIT DATE : / / MONITOR OPEN PATH NUM : PROJECT CLASS : 01
ANALYZING LAB : 000 PROBE LOCATION ( ):
UNRESTRIC AIR FLOW: PROBE HEIGHT : 7 M HORIZONTAL DISTANCE : VERTICAL DISTANCE :

DOMINANT SOURCE (2): AREA
MEASUREMENT SCALE (4): URBAN SCALE - 4 KM TO 50 KM
MONITOR TYPE OBJECTIVE (2): POPULATION EXPOSURE

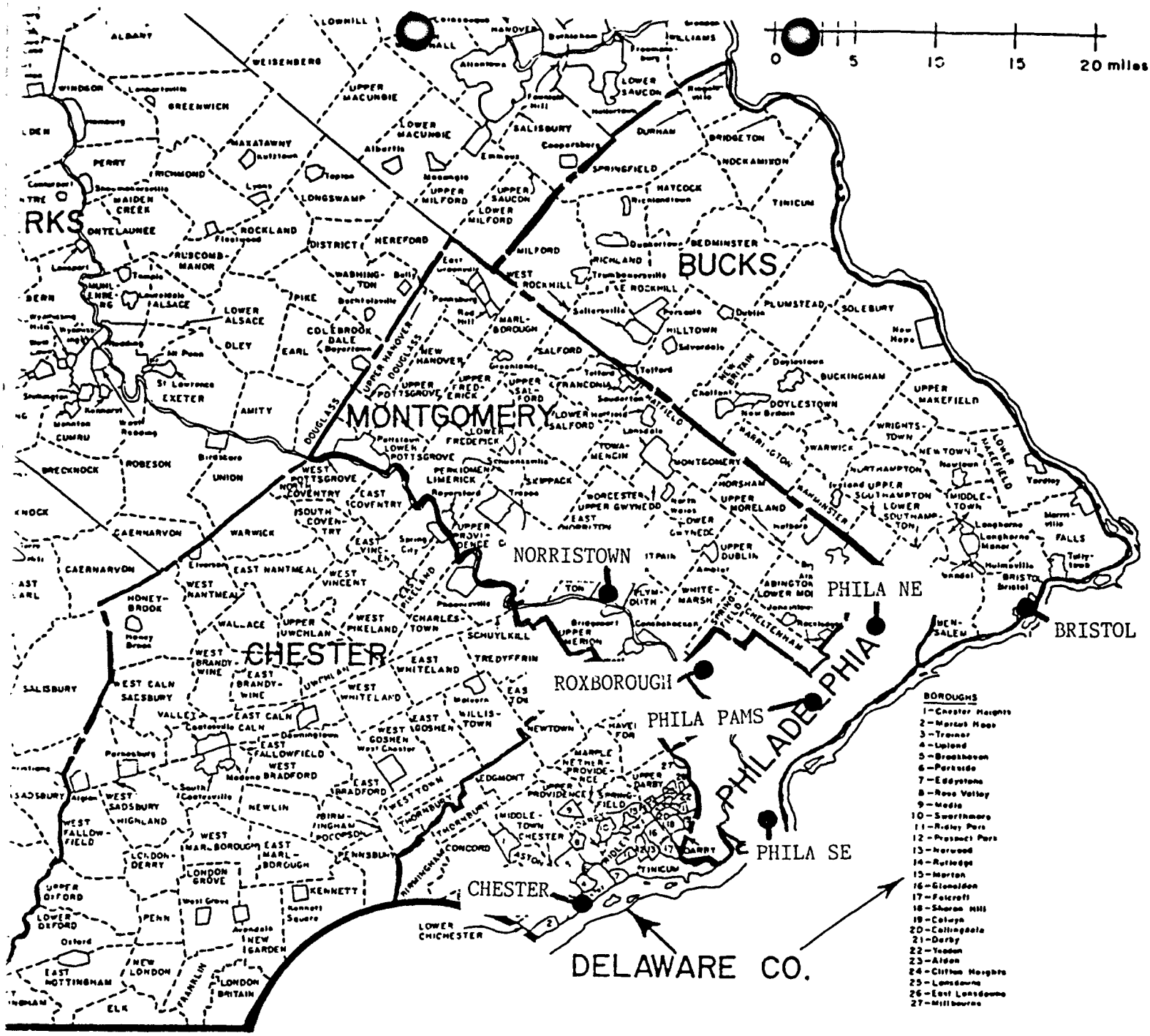
ROAD DESCRIPTION:

STREET NUMBER	DISTANCE FROM ROAD
1	38 M

MONITOR COMMENTS 1: 14

OZONE
PARAMETER : 44201 DATE SAMPLING BEGAN: 1974/01/01 SITE CRITERIA MET : DATE SITE CRITERIA MET: /
POC : 1 DATE SAMPLING ENDED: / / REF MTHOD USED : REF METHOD USED DATE : /
MONITOR TYPE : 3 DATE TYPE EFFECTIVE: 1981/01/01 QA PLAN : QA EFFECTIVE DATE : 81/01
REPORTING ORGANIZ : RO EFFECTIVE DATE : / / ACTION TYPE : ACTION TYPE REASON :
COLLECTING LAB : 000 AUDIT DATE : / / MONITOR OPEN PATH NUM : PROJECT CLASS : 01
ANALYZING LAB : 000 PROBE LOCATION ( ):
UNRESTRIC AIR FLOW: PROBE HEIGHT : 5 M HORIZONTAL DISTANCE : VERTICAL DISTANCE :

MONITOR COMMENTS 1: 11



PENNSYLVANIA VOC AND OZONE MONITORING SITES

SITE	COUNTY	ADDRESS
NORRISTOWN	MONTGOMERY	STATE ARMORY 1046 BELVOIR ROAD
BRISTOL	BUCKS	ROOSEVELT JUNIOR HIGH SCHOOL ROCKVIEW LANE
CHESTER	DELAWARE	FRONT & NORRIS STREETS
PHILA NE	PHILADELPHIA	PHILADELPHIA NE AIRPORT GRANT & ASHTON ROADS
ROXBOROUGH	PHILADELPHIA	WATER PUMP STATION EVA & DEARNLEY STREETS
PHILA SE	PHILADELPHIA	SEWAGE TREATMENT PLANT FRONT & PACKER STREETS
PHILA PAMS	PHILADELPHIA	PHILA AMS LAB 1501 E. LYCOMING AVE

FIGURE 1

FIGURE 2

Phila PAMS Site

2 km Radius

1/4 MILE RADIUS MAP SHOWING DISTANCE AND DIRECTION TO

MAJOR VOC SOURCES

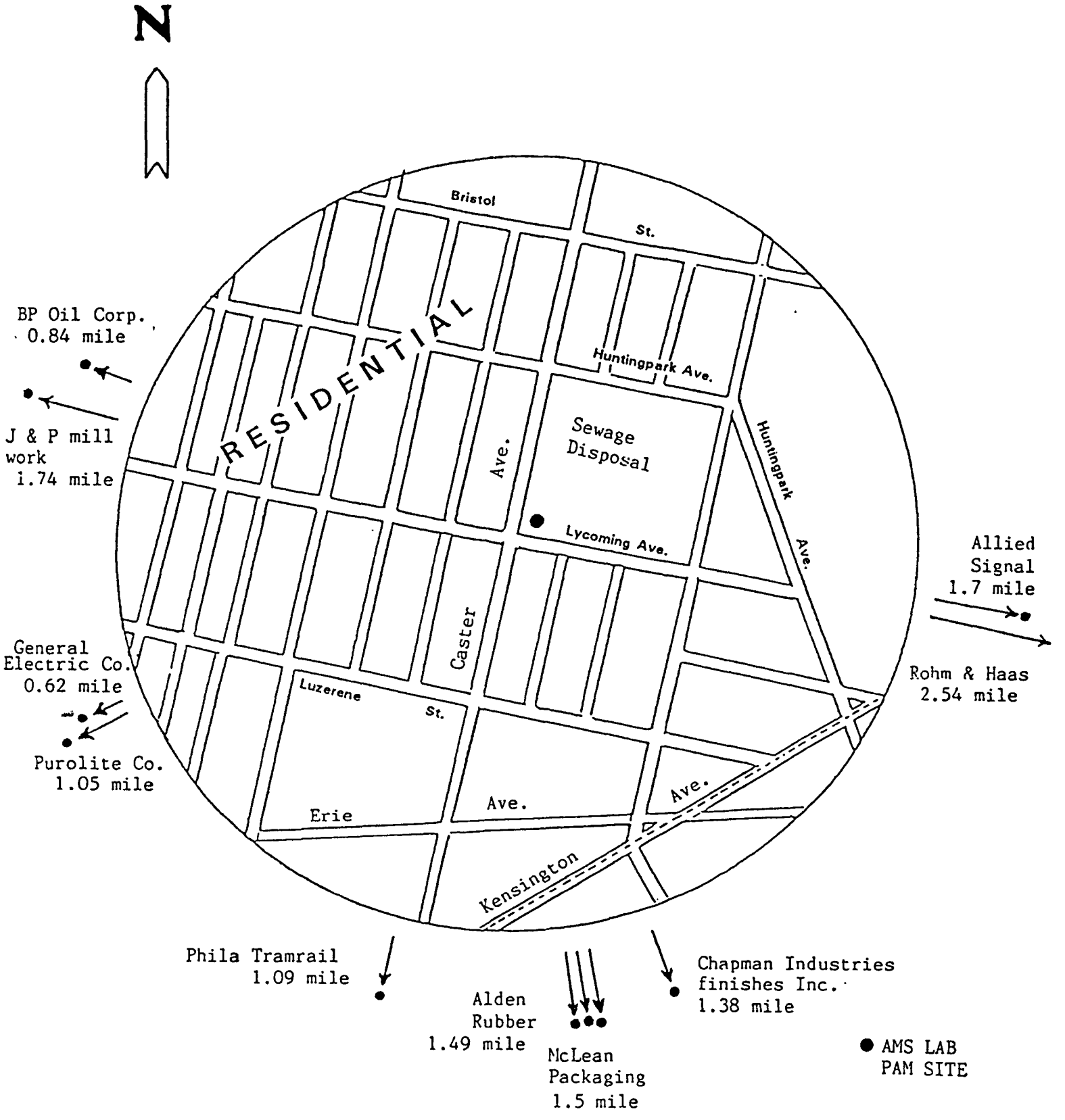


FIGURE 3

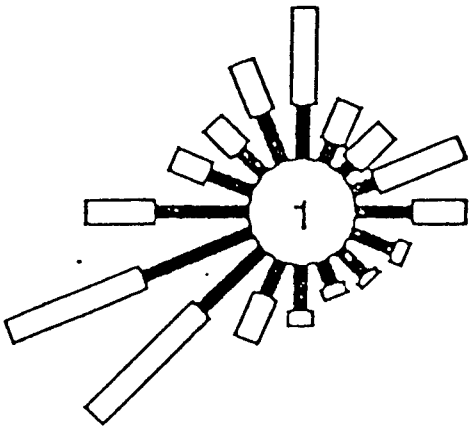
Morning Wind Roses for Philadelphia CMSA

Philadelphia PA

10 years

AM

observed highs



conducive days

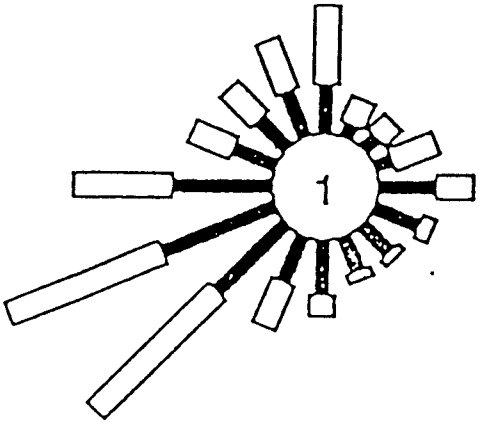


FIGURE 4

ATTACHMENT C - EMISSIONS INFORMATION

Figure 5 - Emission Inventory, Phila MSA

Figure 6 - Phila VOC Sources

Figure 7 - Phila NOX Sources

Figure 8 - Phila CO Sources

ATTACHMENT C

EMISSION INVENTORY SUMMARY
1990 BASE YEAR

Pennsylvania portion of Philadelphia MSA
(Delaware, Maryland, and New Jersey Counties Excluded)

TONS PER DAY*

	POINT	AREA & NON-ROAD	BIOGENIC	MOBILE
VOC	154	263	116	155
CO	68	776		1,173
NOX	165	120		143

* Typical Summer Day

FIGURE 5

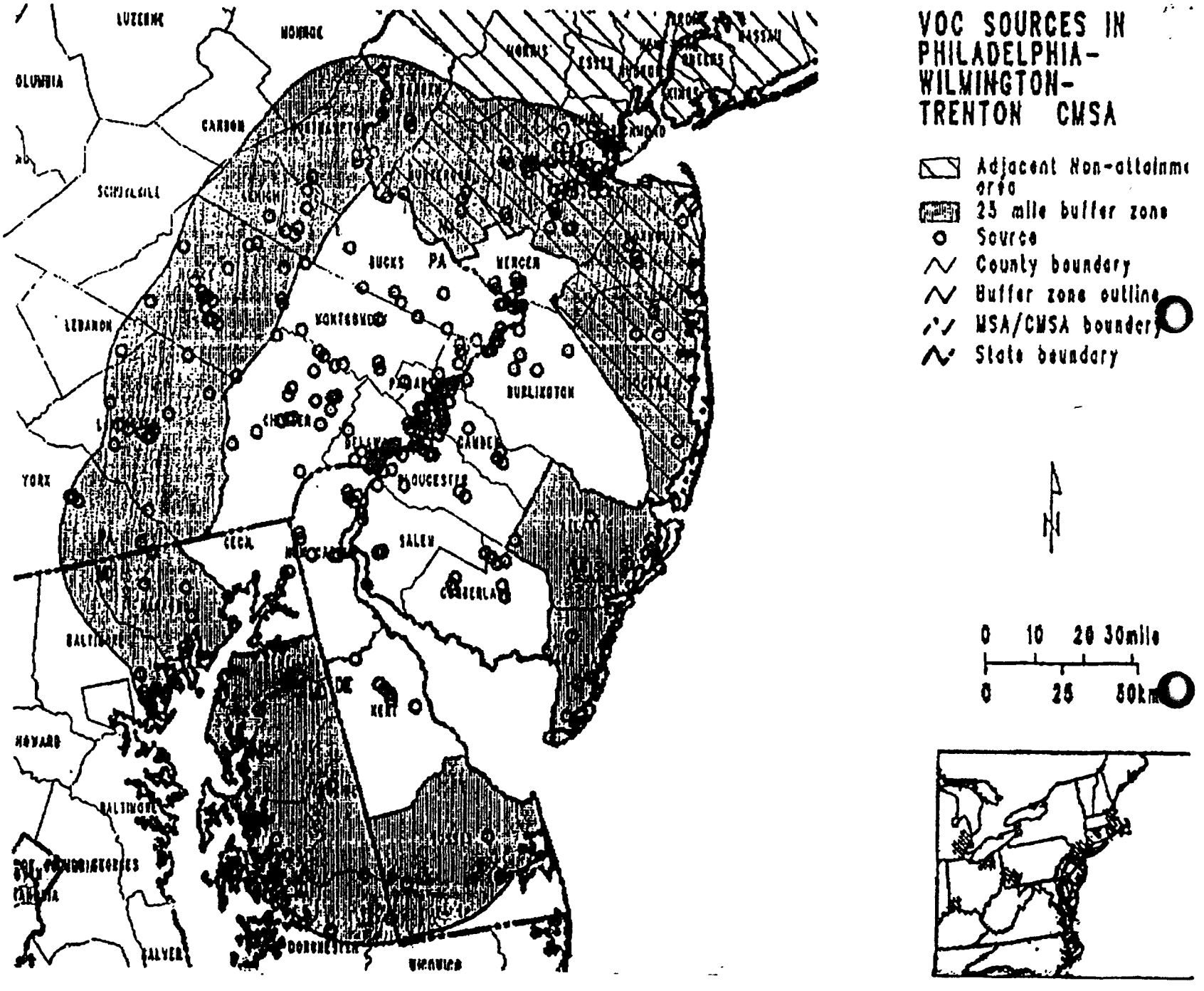

VOC SOURCES IN PHILADELPHIA-WILMINGTON-TRENTON CMSA
Adjacent Non-attainment area
25 mile buffer zone
Source
County boundary
Buffer zone outline
MSA/CMSA boundary
State boundary
BUCKS
PA
MERCER
BURLINGTON
CAMDEN
GLOUCESTER
SALEM
CUMBERLAND
CECIL
YORK
LEBANON
CARBON
MONROE
LUZERNE
SCHUYLKILL
BALTIMORE
HOWARD
KENT
DE
DORCHESTER
SALVER
0 10 20 30mile
0 25 50km

FIGURE 6

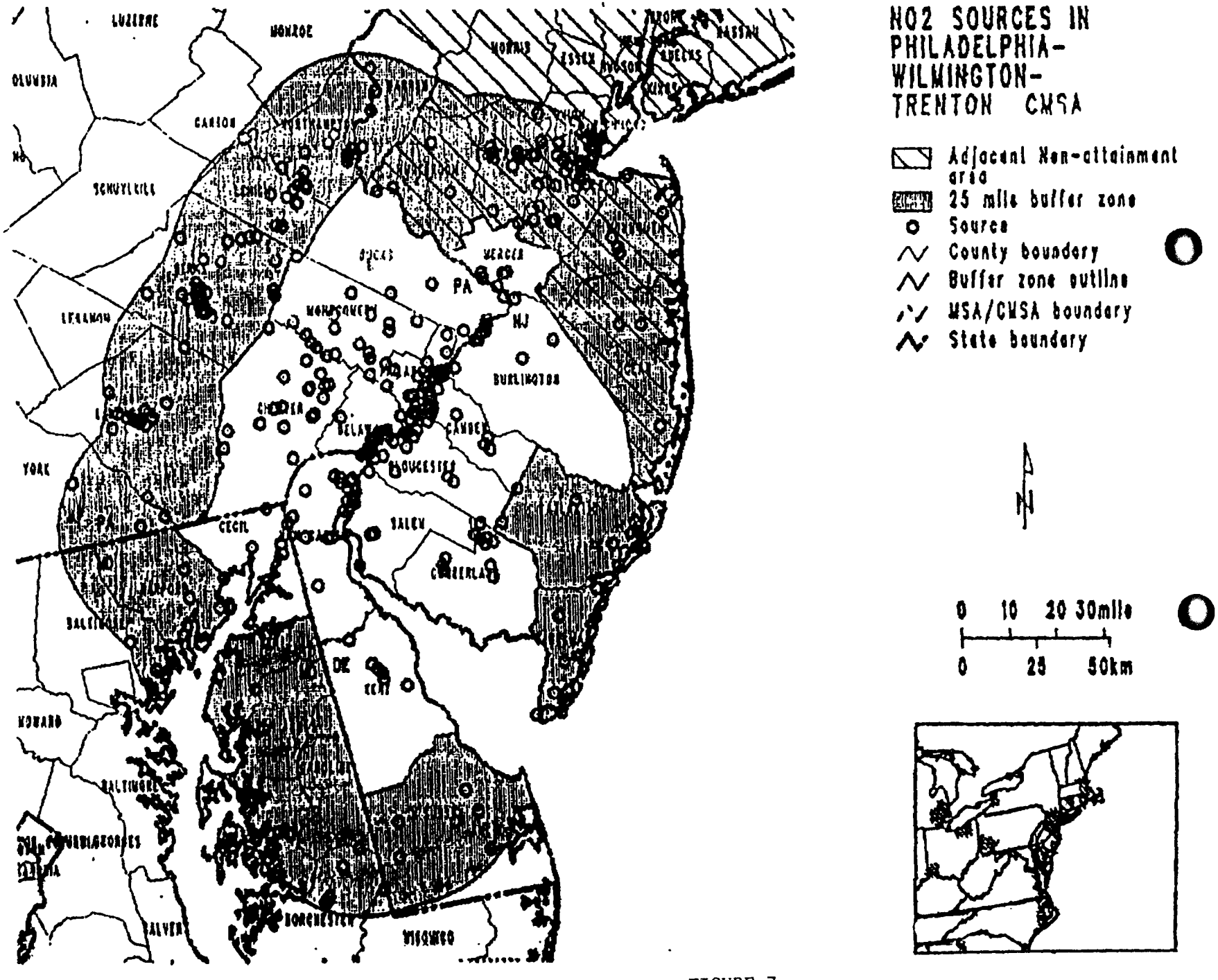

NO2 SOURCES IN PHILADELPHIA-WILMINGTON-TRENTON CMSA
Adjacent Non-attainment area
25 mile buffer zone
Source
County boundary
Buffer zone outline
MSA/CMSA boundary
State boundary
N
0 10 20 30mile
0 25 50km
LUZERNE
MONROE
SCHUYLKILL
BERKS
LEBANON
YORK
CECIL
SALEM
HOWARD
BALTIMORE
DORCHESTER
WICOMICO
PA
NJ
DE

FIGURE 7

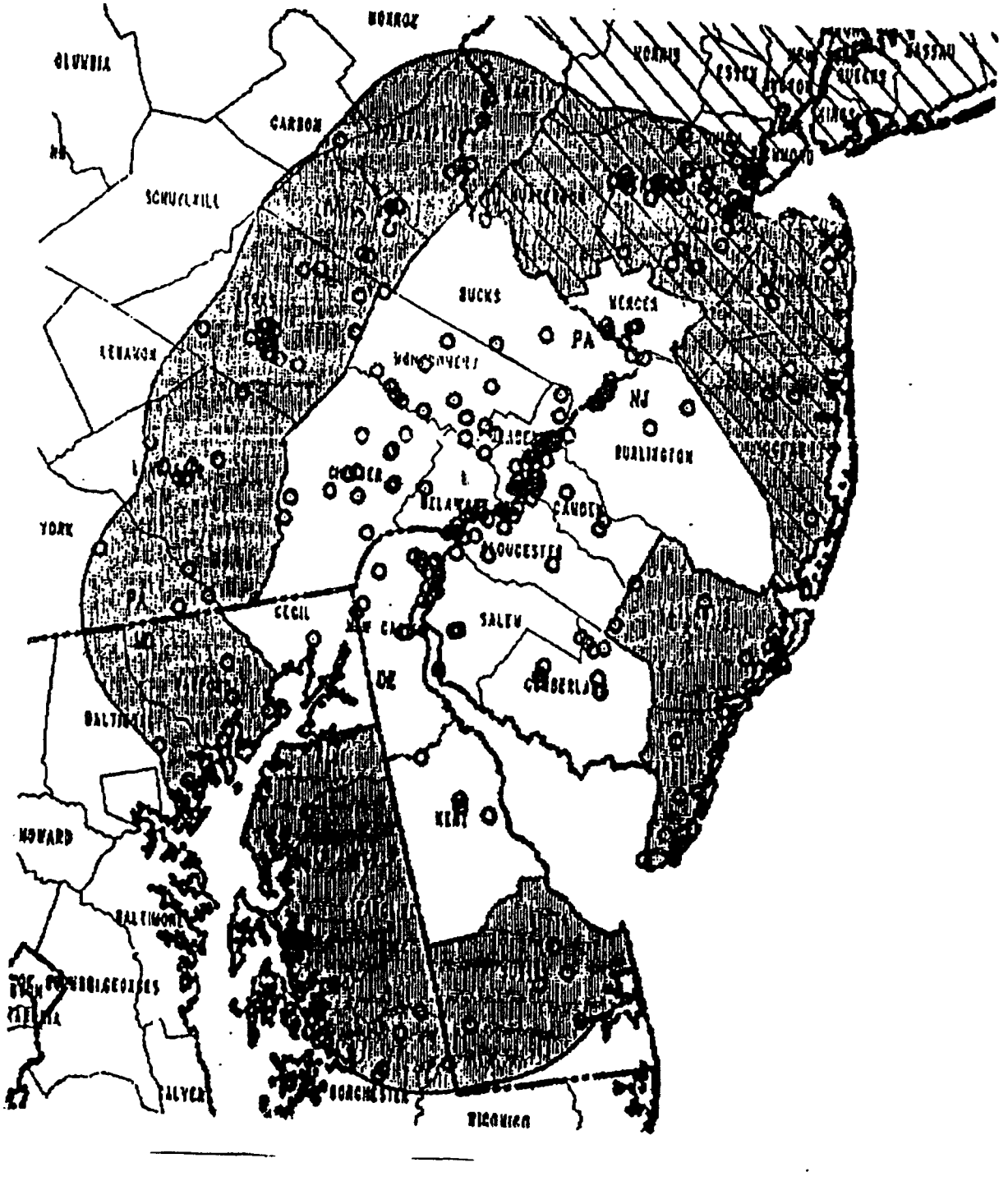

CO SOURCES IN PHILADELPHIA-WILMINGTON-TRENTON CMSA
Adjacent Non-attainment area
25 mile buffer zone
Source
County boundary
Buffer zone outline
MSA/CMSA boundary
State boundary
0 10 20 30mile
0 20 30km
BUCKS
MERCER
BURLINGTON
CAMDEN
GLOUCESTER
SALEM
CECIL
KENT
YORK
HOWARD
PA
NJ
DE

FIGURE 8